



# Structural Health Monitoring for Commercial Space Vehicles

## Problem Statement

- Despite a broad use in many engineering fields, Structural Health Monitoring (SHM) technologies aimed at increasing safety and reducing operation cost of a vehicle, have seen limited applications in space systems.
- Proposed flights will allow to test selected SHM technologies in realistic environment and investigate sensor performance.
- Potential customers include commercial companies and government entities involved in development and operation of space systems.

## Technology Development Team

- Andrei Zagrai, New Mexico Institute of Mining and Technology, azagrai@nmt.edu.
- New Mexico Institute of Mining and Technology, FAA, AFRL provided funding for this work.
- Seth Kessler, Metis Design MicroStrain corporation, LANL

## Proposed Flight Experiment

### Experiment Readiness:

- The experiments are planned to be ready for launch in late fall 2012.

### Test Vehicles:

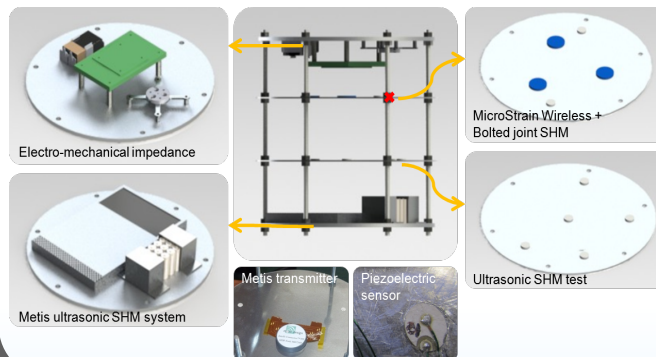
- High-altitude balloon, Near Space Corporation.
- sRLV, SpaceLoft rocket, Up Aerospace.

### Test Environment:

- High-altitude environment for sensor testing.
- Suborbital trajectory for testing SHM technologies, one of which was flown on sRLV in May 2012 (sponsored by NMSGC).

### Test Apparatus Description:

- Three SHM experiments are integrated on rack. Sensors are monitored via impedance tests.



## Technology Maturation

- Sensor endurance and durability of sensor/structure integration. Electronics functioning during flight. In-flight detection of structural damage.
- Provide SHM data during flight. Verify functionality of sensors and electronics in near space and space environments.
- Technology maturation deadline depends on sensor/structure integrity and hardware functionality.

## Objective of Proposed Experiment

- Investigate fundamentals of elastic wave propagation in realistic flight environment.
- Monitor sensor/structure integrity using electro/magneto mechanical impedance tests.
- Demonstrating wireless sensing capabilities during spaceflight.
- Wave propagation and impedance data will guide development of future SHM systems for space vehicles.